

WHAT IS CLAIMED IS:

1. A glass substrate for a mask blank obtained by etching followed by post-processing steps, including a precision polishing step, wherein the surface roughness of a main surface of the glass substrate is 0.2 nm or less in terms of root mean square roughness (RMS).

2. The glass substrate for a mask blank according to claim 1, wherein the etching has an operation for eliciting a defect remaining on the main surface of the glass substrate.

3. The glass substrate for a mask blank according to claim 1 or 2, wherein a surface defect of the main surface of the glass substrate cannot be detected by visual inspection.

4. The glass substrate for a mask blank according to any one of claims 1 to 3, wherein the turned-down edge amount of a peripheral portion of the main surface of the glass substrate is from -2 μm to 0 μm .

5. A mask blank comprising a thin film that causes an optical change in response to transfer exposure light, the thin film being formed on the main surface of the glass substrate for a mask blank according to any one of claims 1 to 4.

6. A transfer mask comprising a thin film pattern that causes an optical change in response to transfer exposure light, the thin film pattern being formed on the main surface of the glass substrate for a mask blank according to any one of claims 1 to 4.

7. A method of producing a glass substrate for a mask blank, comprising a step for eliciting a defect remaining on the main surface of the glass substrate, wherein a post-processing step that includes precision polishing is carried out after the step for eliciting a defect.

8. The method of producing a glass substrate for a mask blank according to claim 7, wherein the post-processing step comprises a precision polishing step for providing the main surface with precision polishing and a cleaning step for cleaning the main surface after the precision polishing step.

9. The method of producing a glass substrate for a mask blank according to claim 8, wherein the main surface of the glass substrate after the cleaning step has roughness of 0.2 nm or less in terms of the root mean square roughness (RMS).

10. The method of producing a glass substrate for a mask blank according to claim 7, wherein the step for eliciting a defect is carried out by etching the main surface.

11. The method of producing a glass substrate for a mask blank according to claim 8 or 9, further comprising a defect inspection step that follows the cleaning step.

12. A method of producing a glass substrate for a mask blank whereby to produce a glass substrate by carrying out a rough polishing step for polishing a surface of the glass substrate by using abrasive particles having a predetermined average particle size, then a precision polishing step for polishing the surface of the glass substrate by using abrasive particles having an average particle size that is smaller than the aforesaid predetermined average particle size,

wherein, prior to the precision polishing step, the surface of the glass substrate is etched to elicit a crack, which extends from the surface of the glass substrate in the direction of the depth and remains after the precision polishing step, in a defect inspection step carried out after the precision polishing step.

13. The method of producing a glass substrate for a mask blank according to claim 12, wherein a cleaning step for cleaning the main surface of the glass substrate is carried out after the precision polishing step.

14. The method of producing a glass substrate for a mask blank according to claim 13, wherein the main surface of the glass substrate after the cleaning step has roughness of 0.2 nm or less in terms of the root mean square roughness (RMS).

15. The method of producing a glass substrate for a mask blank according to claim 13 or 14, wherein the cleaning step uses a solution having an etching function as a cleaning solution, and the cleaning step is carried out under a condition that causes the glass substrate to be removed by more than 0 μm and below 0.01 μm by etching.

16. The method of producing a glass substrate for a mask blank according to claim 11 or 12, wherein the defect inspection step is carried out by a visual inspection:

17. The method of producing a glass substrate for a mask blank according to claim 10 or 12, wherein the etching removes the surface of the glass substrate that is subjected to precision polishing by 0.01 to 0.2 μm .

18. A method of producing a mask blank, whereby a thin film that causes an optical change in response to transfer exposure light is formed on a main surface of the glass substrate obtained by the method of producing a glass substrate for a mask blank according to any one of claims 7 to 17.

19. A method of producing a transfer mask, wherein the thin film in the mask blank according to claim 18 is patterned to form a thin film pattern.